

Cucumber

ATLANTIC PROVINCES VEGETABLE CROPS GUIDE TO PEST MANAGEMENT 2002 - 2003



Agriculture and Forestry
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Introduction

The cucumber belongs to the Cucurbitaceae (gourd family). The cucumber belongs to the genus *Cucumis* of which there are 20 to 25 species found mostly in Asia and Africa. Only two *Cucumis sativus* (cucumber) and *Cucumis melo* (melon, muskmelon and persian melon) are of commercial importance in North America. It is an annual trailing or climbing vine usually with flowers of both sexes on the same plant (monoecious). Current market hybrids are produced on genetically gynoecious lines (all female blooms). Commercial seed lots have up to 10% of a monoecious variety to provide sufficient pollen for fruit set. European greenhouse cucumbers set fruit without pollination (parthenocarpic). The cucumber is native to the northwest of India and has been cultivated there for at least 3000 years. The cucumber was known in France in the 9th century and was common in England in 1327.

Cucumbers are very sensitive to cold temperatures and may be killed at 1°C. It has a minimum germination temperature of 16°C, an optimum germination range of 16°C to 35°C, with an optimum germination temperature of 35°C, and a maximum germination temperature of 40°C. Soil temperatures at planting must be at least 10°C for table cultivars and 13°C for gherkin cultivars. Planting must be delayed until all danger of frost is past. Windbreaks are essential for early production of this crop.

A well drained loam to sandy loam soil with high organic matter with no frost pockets or problems with surface drainage is the ideal field situation. Wind protection, natural or artificial, is necessary.

Slicing cucumbers, with the aid of plastics, are harvested from the field in early to mid July. Most of the field crop does not come on until early August. Slicing cucumbers average 15,000 kg per hectare with some yields as high as 22,000 kg per hectare. Due to market gluts in warm seasons not all of the crop is marketed. (2,500 doz per hectare to 5,000 doz per hectare). Pickling cucumber yields depend on the size of fruit harvested. (15,000 to 17,000 kg per hectare).

Cucumbers are an important crop in the Atlantic area though market potentials may not be large. On the fresh side there is a strong demand for the product as it is a salad vegetable but processing cucumber markets have declined. The greatest potential would seem to be to extend the season by earlier production (use of plastics) and to look for speciality markets.

Nutrient Content: Contains fair amounts of potassium, calcium and folate; and small amounts of other nutrients including Vitamin C. Very low in calories. 6 slices contains 5 kilocalories.

Crop Establishment

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Seed Treatment - seed may be pelleted to facilitate planting with precision seeders. Often though raw seed is used with non precision seeders. Seed should be treated before field seeding, especially for seed maggots.

Transplant production - crops for early harvest are usually planted in peat pellets, peat blocks, peat pots or cellular trays. Remember this plant does not stand cold (see temperature requirements). Plant 3 seeds per cell and then thin to 2 plants. This crop does not take the transplant shock of bare roots. These plants are best grown on an artificial soil mix. Young plants with 2 true leaves are the best for field setting. The peat pots must be well soaked and must be completely buried when transplanted to prevent excessive drying of the soil in the pots. The seeding rate for transplant production is 2.2 kg per hectare.

Seeding/Planting - Approximately 3 to 5 kg of seed per hectare are required for direct seeded crops. Higher populations need more fertilizer and water and are more sensitive to weed competition, but yields per hectare should be higher. Cucumbers should be seeded no deeper than 1.0 to 2.0 cm.

Rows should be spaced 120 to 180 cm apart with plants 20 to 30 cm apart. The present trend is toward higher plant populations per hectare by closer spacing of the rows.

With direct seeding, seed outdoors when the ground has warmed, and danger of frost has passed. A second planting may be made beside the first a few days later if germination is doubtful to ensure the earliest possible satisfactory stand. One planting can be destroyed later if not required. Seed may be sown 2 or 3 weeks earlier under hotcaps or under row tunnels.

Seeding for pickling cucumbers can continue through mid to late June depending on market scheduling.

Crop Management

Transplants - Early cucumbers which have been started in containers are not usually field set until early to mid June (3 to 4 weeks after planting). Large containers such as 24, 38, 72 or 128 cell trays may be used to produce a better quality transplant that bears earlier. Row covers, hotcaps and/or windbreaks will protect the tender plants from cold and wind injury, especially during the first 2 or 3 weeks in the field. The covers should be removed gradually.

Plastic Mulching - Mulching transplants or seeding directly through mulches or black polyethylene has been proven beneficial because of an increase in early and total yield. These mulches also conserve moisture, control weeds, accelerate maturity by increasing soil temperature and reduce fruit rots. Clear mulch will warm the soil more than black but weed growth may be a problem under the mulch. The infrared transmitting mulches provide more soil warming and more weed suppression than clear plastic. Some weed growth can occur under cool growing conditions. The plastic should fit snugly against the soil surface. Do not lay plastic on dry soil, either irrigate or wait for rain.

The polyethylene films are usually black or some other dark color in order to control weeds. If a clear film is used, a preemergence herbicide must be applied to the soil before laying the mulch. Clear mulches have been shown to be more effective at increasing yields due to the higher soil temperatures they achieve. Commercial machines are available to transplant plants in peat pots through the mulch. There are also seeders that can plant through the mulch.

When mulches are used less fertilizer may be required as the mulch permits plants better rooting in the surface layer and less nitrogen is lost by leaching.

Floating row mulches made of polyester or nylon type materials are laid over the transplants without hoops. Some materials may be abrasive to young transplants and they should not be used unless experience has shown that they are safe for use on the crop.

Early Plant Death - In some growing seasons vine crops of that have been recently transplanted or which have recently germinated, suddenly wilt and die. Most often, this situation occurs during a period of 4 to 5 days of rainy or cloudy weather. Without sunshine, soil temperatures drop below 13 to 16°C. At these temperatures the plant roots cannot absorb water from the soil. Consequently, when the sun does reappear, water transpires from the leaves much more rapidly than the roots absorb water, resulting in the sudden wilting and death. The earlier the planting date the greater the susceptibility to this problem. Also, the disease pythium is usually involved.

Irrigation - returns for pickling cucumbers may increase with proper irrigation. With irrigation, it is possible to ensure more uniform emergence and plant development under dry soil conditions. Weed control chemicals are also more effective when followed by a light irrigation. High plant populations can also be safely grown without losses due to lack of soil moisture. The water needs of a cucumber plant are most sensitive during the fruit

set and development period. Minimize the time foliage is wet to help avoid disease.

Wind - Winds not only damage plants but slow down the rate of growth. If no natural protection is available, strips of corn or fall planted rye can be used. There are also plastic fencing materials currently on the market. Wind protection is provided for a distance equal to ten times the height of the windbreak provided the right porosity (50%) is used. In terms of both artificial and plant windbreaks use them in north-south rows at right angles to the prevailing winds. In the absence of a windbreak, it is preferable to plant rows in the direction of the prevailing wind.

Pollination - Cucumber pollination is accomplished by honey bees, so it is essential to have colonies in or alongside the field. Gynoecious hybrid varieties need at least one colony of honey bees per hectare. Seed of commercial hybrid cultivars usually contain 10 to 15% monoecious seed. This percentage could be lower and there would still be enough male flowers to supply pollen if the male flowers are uniformly dispersed in the field. It is best to place the colonies in the field about 6 days after bloom starts. This ensures that flowering will be sufficient to attract bees into the field. It is important to encourage bees to forage on the cucumber flowers rather than on other plants in the area. Warm, sunny weather will allow pollination for some crops to be completed in less than one week. Insecticides applied to fields will poison honey bees. Notify your beekeeper before application of any pesticide.

Nutrition

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ALL ADDITIONS OF LIME AND FERTILIZER OR MANURES SHOULD BE BASED ON RECOMMENDATIONS FROM A SOIL TEST.

Cucumbers are a crop requiring a moderate amount of fertilizer.

Manure - All vine crops respond well to manure. If available apply 22 to 45 tonnes per hectare and reduce fertilizer proportionately. Most vine crops do well after a sod of perennial forage crop since soil structure is usually at it's best.

Lime - Lime to a pH of 6.0 - 6.8.

Nitrogen - Apply at least part of the nitrogen preplant. Generally this is up to 100 kg of nitrogen per hectare broadcast. The remainder of the nitrogen should be sidedressed before the vines begin to run. On sandy soils a second application may be necessary after the vines begin to run, especially following heavy rains. Foliar applications of urea may be used if slicing cucumbers or pickling cucumbers are to have multiple harvests.

Phosphorous - Adequate phosphorous is essential for vine crops. If possible band part of the phosphorous.

Potash - Apply only the required applications either broadcast and incorporated before planting or part may be banded 5 cm to the side and 5 cm below the seed.

Magnesium - If soil magnesium levels are low a fertilizer containing magnesium may be used. Foliar sprays may also be used.

Sulfur - On sandy soils with low organic matter that have been intensively cropped soil sulphate levels may be low. Application of gypsum should be considered on these soils.

Application Method: Up to 100 kg of (N + K) per hectare can be applied in a band, 5 cm to the side and 5 cm below the seed at planting with the remainder of the fertilizer broadcast before planting. Nitrogen may also be sidedressed or applied to the foliage.

Pests and Pest Control

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Weeds

Herbicides registered for use on cucumbers do not provide total, season long control. Successful weed control requires integrating cultural and chemical methods. Preplanting control of perennial weeds is essential. Cucumbers should be planted to land where the annual weed seed population has been reduced by cultural procedures such as crop rotation, summer fallowing or stale seedbed. Cultivation will be required to supplement chemical weed control.

Many growers use plastic mulch in the production of cucumbers. Opaque plastic can be used to control weeds in the row in main crop cucumbers. Contact your local agriculture office for information on controlling weeds growing between the rows of plastic mulch.

Care must be taken to avoid fields where residual herbicides from previous years persist in the soil as crop injury may occur.

Diseases

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Damping off (fungi)

Characteristics: Several fungi may cause damping off. This disease may take several forms including decay of the seed immediately following seeding or germination, and post emergence damping-off where the fungi attacks the stem at the soil line causing a constriction which causes the young seedling to topple over. Damping off fungi may also cause a root rot. Pythium is favored by cold temperatures and infected peat.

Control: Sow seeds treated with a fungicide. For greenhouse grown plants, sterilize soil (or use an artificial mix) and disinfect work areas, benches, flats, etc. Drench seedlings with an appropriate fungicide.

Leaf Spots

- *Alternaria* (fungus), angular (bacterium)

Characteristics: *Alternaria* causes small circular spots which enlarge up to 2 cm in diameter with dark concentric rings within the spots. Spots coalesce to affect large areas of the leaf.

Angular leaf spot causes small angular spots that are irregular in shape and size. May attack fruit causing water soaked spots. Fruit rot follows. Both organisms overwinter on

the seed or in plant residue in the soil.

Control: Follow a 1 to 2 year rotation. Apply a fungicide at first sign of disease and at 7 to 10 day intervals. Use an alternating schedule with an organic fungicide for *Alternaria* and fixed copper for angular leaf spot.

Powdery Mildew (fungus)

Characteristics: Appears as a white powdery growth on leaves which may cause leaves to wither and die. It tends to be a problem in some varieties more than others. It is favored by high temperatures.

Control: Resistant cultivars are available. For susceptible cultivars apply an appropriate fungicide at the first sign of the disease and at 7 to 10 day intervals.

Cucumber Scab (fungus)

Characteristics: A fungal disease which overwinters in seed and in crop residue. Infected fruit will have dry, sunken corky areas up to 1 cm in diameter. Scab areas on leaves will cause misshaped leaves. The disease is brought on by moist, humid conditions and cool night temperatures.

Control: Use resistant cultivars. No cultivar is completely immune so follow a 2 year crop rotation. Effective fungicides are also available.

Bacterial Wilt (Bacterium)

Characteristics: First sign of disease will be wilting of individual leaves. Later, branches or even the entire plant will wilt and eventually die. Bacterial wilt overwinters in the Cucumber Beetle and is transmitted to the plant when the insect feeds.

Control: Apply insecticides to control the cucumber beetles.

Mosaic (virus)

Characteristics: Several mosaic viruses may infect cucumber. Cucumber mosaic virus (CMV) is the most important. CMV infected plants are stunted, and new leaves are dwarfed, mottled and sometimes distorted. Fruit exhibits a yellowish-green mottle. The virus overwinters in perennial weeds such as milkweed, ground cherry, pokeweed, motherwort and chickweed. Aphids and sometimes cucumber beetles transmit the virus.

Control: Grow resistant cultivars. Control aphids and cucumber beetles. Eliminate reservoir weed hosts within and surrounding cucumber fields.

Insects

Seedcorn Maggot

Characteristics: Small yellowish-white maggots 6 mm long with a pointed head end. The

adult is a small grayish-brown fly. Maggots feed on seed, causing seed to produce a poor plant, and will also feed on roots, causing poor plant growth. Seed corn maggots frequently attack deeply planted seeds.

Control: Plant as shallow as needed in a well prepared seedbed. Early germination is necessary to get good plant stands and prevent injury. Later planted crops are not as susceptible to this pest. Good weather conditions are necessary to completely control the pest. Avoid planting susceptible crops in fields recently manured. Chemical seed treatment is essential.

Cutworms

Characteristics: Cutworms are dull colored, soft bodied caterpillars found at the base of plants, just under the soil level. They feed on seedlings, cutting them at soil level or just below.

Control: See Atlantic Provinces "GUIDE TO PEST MANAGEMENT" for vegetable crops.

Cucumber Beetle

Characteristics: The striped cucumber beetle overwinters in the adult stage under leaves or dense grass, emerging in May or early June. The adult is 5 mm long. Its upper surface is about equally black and yellow, with the folded wing covers bearing three black stripes. Hot, humid weather favors the beetle feeding. Two weeks after emerging, the beetles mate and lay eggs. The orange-yellow eggs are laid in the soil at the base of host plants and hatch within 10 days. Upon hatching, the larvae burrow into the soil and start to feed on roots. Two weeks later, a new generation of beetles appear. In Canada, there is only a single generation per year. They are a carrier of bacterial wilt.

Control: Apply insecticides when insects first appear and repeat as necessary. If not controlled this insect may cause a lot of damage.

Two-Spotted Spider Mite

Characteristics: An occasional pest but when it does occur, it can be serious. Leaves become speckled and then turn bronzed or brown. A fine webbing is produced on the underside of the leaves. The mites are microscopic in size. Usually this pest only becomes a problem under very hot dry weather conditions.

Control: Apply appropriate miticide.

Tarnished Plant Bug

Characteristics: Small 6 mm long insect, mottled white and yellow with touch of black on wings. Nymph is very small, greenish-yellow and marked with black dots on the thorax and abdomen. They overwinter under bark or leaf-litter, emerging early in the spring and feeding on weeds and fruit buds. After mating, eggs are laid on stems and petioles. Nymphs (yellowish-green, 1 mm long) emerge after 10 days, undergoing two molts to

become adults within 3 to 4 weeks. Adults and nymphs are equally damaging.

Control: Apply insecticides when insects first appear and repeat as necessary.

SPECIFIC CONTROLS FOR THE VARIOUS CROP PESTS MAY BE FOUND IN THE ATLANTIC PROVINCES VEGETABLE CROPS "GUIDE TO PEST MANAGEMENT".

Harvesting and Handling

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Fruits of slicers should be harvested before the seeds become too well developed. This is usually while the fruits are still a little rough. Do not allow any fruits to remain and form seed on the vines, because production of new fruit will be reduced. Picklers should be harvested regularly, to market or processor size requirements.

Impacts and pressure during handling can cause serious damage to pickles which cannot be seen because it is internal. This internal damage increases bloating during brining and drastically lowers the value of the pickles. All key operations such as loading, hauling, unloading and grading influence the quality of pickles that go into the processing plant.

Minimize or eliminate the dropping of cucumbers whenever possible. Bruising and breakage of cucumbers is influenced by the height of discharge above the collection source (e.g. basket, bin or truck). Research indicates that a 75 cm drop on a hard surface causes visible internal fractures. Every effort should be made to reduce the number and height of drops. Foam rubber (7 to 8 cm minimum) on the floor of transport vehicles drastically reduces the otherwise severe damage to the first few layers of fruit. If cucumbers are piled deep in transport vehicles, the likelihood of damage increases.

Storage and Conditioning

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The recommended storage temperature is 10&deg to 13&degC at a relative humidity of 95%. Even under these conditions, cucumbers cannot be expected to keep satisfactorily for more than 2 to 3 weeks. Chilling injury develops rapidly at temperatures below 10&degC, and above 13&degC ripening and yellowing occurs. Once pulled the cucumbers should be cooled as quickly as possible. Humidity should be kept high to prevent shrivelling. Cucumbers for fresh market can be waxed or shrink-wrapped in polyethylene film to minimize water loss. Holding cucumbers at higher temperatures will cause a rapid loss of green color. Loss of color will also occur more rapidly if held in the same room with apples, tomatoes or other ethylene producing crops.

Pickling cucumbers are normally stored for long periods of time in brine solution. If, however, fresh pickles need to be stored or held for a short period of time before being processed or placed in brine tanks, the cucumbers should be cooled as rapidly as possible to 10&degC. Hydrocooling has been used successfully to remove field heat.

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(See also General References)

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Prepared by: Horticulture Section, Production Technology Branch, Nova Scotia Department of Agriculture & Marketing on behalf of APASCC and members:

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PEST	PESTICIDE (Formulation)	RATE Product	DAYS TO HARVEST	REMARKS
Weeds				
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Preplant Perennial Weeds including quackgrass	ROUNDUP 356 Sn	2.5 to 7.0 L/ha	-	Apply in the fall or spring prior to planting. Annual weed control programs will be necessary to control weeds germinating after planting. For quackgrass control apply to actively growing quackgrass when at least 4 new leaves are present. The low rate (2.5 L/ha) will provide a minimum of one season control, while higher rates (4.75 to 7 L/ha) will provide longer term control. The low rate of Roundup should be applied in 50 to 100 L/ha water. If higher water volumes are used add a suitable surfactant. Wait 72 hours before plowing under. Best control of quackgrass is obtained when these herbicides are applied in the fall.
	TOUCHDOWN 480	2.5 to 7.0 L/ha	-	
	GLYFOS	2.5 to 7.0 L/ha	-	
	ROUNDUP TRANSORB	2.5 to 7.0 L/ha	-	
Preemergence Germinating annuals	ALANAP 240 Sn	11.0 to 30.0 L/ha	-	Apply immediately after seeding and before weeds emerge. In transplanted cucumbers apply after the crop is established, but before weeds emerge. If soil is dry, 1 cm irrigation will improve control. Temporary stunting may occur. Use lower rate on light soils.
Stale Seedbed Technique	GRAMOXONE 200 Sn	2.75 to 5.5 L/ha	-	Apply to foliage of the emerged weeds but before the crop has emerged. Use Gramoxone for best control of grasses.
	REGLONE 200 Sn	2.75 to 5.5 L/ha	-	
	GRAMOXONE PDQ L	2.0 to 4.0 L/ha	-	
Postemergence Annual grasses and volunteer cereals	POAST 184 EC plus MERGE or ASSIST	0.8 to 1.1 L/ha plus	30	Apply when grasses are actively growing in the 1 to 6 leaf stage. Do not use on greenhouse cucumbers.

		1.0 L/ha		
	FUSILADE II 125 EC	0.8 to 1.4 L/ha	30	Apply to annual grasses at the full 2 to 5 leaf stages (2 to 4 leaves for foxtails).
Quackgrass and annual grasses	POAST 184 EC	2.7 L/ha	30	Apply to actively growing quackgrass in the 1 to 3 leaf stage. Inter-row cultivation 7 to 14 days after application will improve control.
	plus	plus		
	MERGE (oil) or ASSIST	1 to 2 L/ha		
	FUSILADE II 125 EC	2.0 L/ha	30	Apply to actively growing plants with 3 to 5 fully developed leaves. Rhizomes should be thoroughly fragmented by tillage prior to application. Inter-row cultivation should not occur until 5 days after application.
Broadleaf and grasses	GRAMOXONE 200 Sn	2.75 to 5.5 L/ha	-	Do not spray solution on the crop plant since it could be injured or killed. Use Gramoxone for best control of grasses.
Inter-row shielded	REGLONE 200 Sn	2.75 to 5.5 L/ha	-	
	GRAMOXONE PDQ L	2.0 to 4.0 L/ha	-	

Insects

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Preplant				See section on "Wireworm, White Grubs and Cutworm Control".
Cutworms and Wireworms				
Seedcorn maggots				See "Seed Treatment".
Postplant	SEVIN 50 WP	2.2 kg/ha	3	Apply when insects or damage appears.
Cutworms	SEVIN 85 WP	1.75 kg/ha	3	
	SEVIN 80 SP	1.5 kg/ha	3	
	SEVIN XLR 43 SU	2.5 L/ha	3	
	SEVIN L 420 SU	2.5 L/ha	3	
	LORSBAN 4E	1.2 to 2.4 L/ha	60	
	PYRINEX 480EC	1.2 to 2.4 L/ha	60	
Cucumber beetles	METHOXYCHLOR 50 WP	1.75 to 4.5 kg/ha	1	Use with caution on cucurbits.
	THIODAN 4 EC	1.5 L/ha	2	Apply when insects first appear.
	ENDOSULFAN 50 WP	1.1 kg/ha	2	
	THIODAN 50 WP	1.1 kg/ha	2	
	DIAZINON 500EC	2.2 L/ha	7	See cautions on the label for the handling of soluble bags. Cucumber beetles may transmit bacterial wilt.
	GUTHION 240 EC	2.25 L/ha	6	
	SNIPER 240 EC	2.25 L/ha	-	
	GUTHION 50 WP	1.1 kg/ha	6	

	GUTHION SOLUPAK 50 WP	1.1 kg/ha	6	
	SNIPER 50 WP	1.1 kg/ha	6	
	AZINPHOS- METHYL (APM) 50 W	1.1 kg/ha	6	
Two-spotted spider mite	KELTHANE 35 WP	1.1 to 1.75 kg/ 1000 L	7	Usually a problem only in hot, dry weather.

Diseases

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Pythium root rot	RIDOMIL 240 EC	9 to 18 ml/100 m	at planting	Apply in a 18 cm band immediately after seeding or prior to transplanting. Incorporate mechanically in the top 5 cm of soil before transplanting or irrigate with 15 to 25 mm of water. Do not apply over the top of transplants as a drench. Do not dip transplants.
Angular leaf spot	FIXED COPPER	see label	1	Apply at first sign of the disease and at 7 to 10 day intervals. An alternating schedule may be used with a fungicide listed for <i>Alternaria</i> leaf spot control. If angular leaf spot is severe, apply FIXED COPPER with each spray.
<i>Alternaria</i> leaf spot Anthracnose Downy mildew	BRAVO 500 F	4.8 L/ha	1	Apply when plants begin to vine. An alternating schedule with FIXED COPPER will help control angular leaf spot. Apply at 7 to 10 day intervals.
	DITHANE 75 DG	1.1 to 3.25 kg/ha	14	
	DITHANE M-45 80 WP	1.1 to 3.25 kg/ha	14	
	MANZATE 200 80 WP	2.25 to 3.25 kg/ha	14	
	MANZATE 200 75 DF	2.25 to 3.25 kg/ha	14	
	PENNCOZEB 75 DF	1.1 to 3.25 kg/ha	14	
	MANEB 80 WP	1.1 to 3.25 kg/ha	5	
	DITHANE M-22 80 WP	1.1 to 3.25 kg/ha	5	
	DYRENE 50 WP	2.5 to 3.75 kg/ha	1	
Anthracnose	CAPTAN 80W	2.25 to 4.25 kg/ha	2	Treat at first sign of disease then at 5-7 day intervals. Use lower rates on young plants and high rate on older plants.
	MANZATE 200 plus BENLATE 50 WP	2.25 kg/ha plus 500	14	Repeat at 7-14 day intervals. Do not apply more than three times on a single crop.

		to 850 g/ha		
	MAESTRO 75DF	2.5 to 4.5 kg/ha	2	Apply at first sign of disease then at 5-7 day intervals.
Bacterial Wilt	-	-	-	Control cucumber beetles - SEE CUCUMBER BEETLES IN INSECT SECTION.
Powdery mildew	BRAVO 500 F	4.8 L/ha	1	As soon as disease appears, spray at 7 to 10 day intervals. Tank mix Benlate with Manzate 200.
	MANZATE 200 plus BENLATE 50 WP	2.25 kg/ha 500 to 850 g/ha	14	